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GREAT LAKES FORESTRY CENTRE
CENTRE FORESTIER DES GRANDS LACS

Results of forest insect and disease surveys in the NORTHERN REGION of Ontario, 1986

CARRIED OUT BY THE GREAT LAKES FORESTRY CENTRE IN COOPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES

L. S. MacLeod, V. Jansons and A. J. Keizer
Miscellaneous Report No. 50

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THE GREAT LAKES FORESTRY CENTRE

The Great Lakes Forestry Centre is one of six regional centres located across Canada and operated by the Canadian Forestry Service. The Service provides federal leadership and a national focus in the forestry sector for the continuing economic, social and environmental benefit of Canadians. The Centre conducts two major programs: research and technical services, and forestry development. Both programs address major problems affecting forest management and the forested environment in Ontario. Because of the transprovincial nature of the forest resource, many elements of the research program are of national significance.

For many years the research program was guided by the Canada-Ontario Joint Forestry Research Committee, made up of senior members of the Centre and the Ontario Ministry of Natural Resources. Responsibilities for coordinating all forestry research in Ontario have now been assumed by the Ontario Forestry Research Committee, which has representatives from forest industry, universities and federal and provincial governments. This Committee also ensures that research results are transmitted to forest managers.

Staff of the forestry development program negotiate and administer federal-provincial cost-sharing agreements with the province of Ontario, conduct economic studies, and assist in implementing job creation programs in the forest sector. This requires close cooperation with the Ontario Ministry of Natural Resources and with other provincial and federal agencies concerned with the forest sector.

The Centre recognizes that forested land must be managed in the best public interest, not only for the wood production essential to our economy but also for the recreational purposes that are so important to our social well-being. These goals must be achieved in a manner that will maintain or improve the quality of the forest environment and preserve it for generations to come.

RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHERN REGION OF ONTARIO, 1986

(FOREST DISTRICTS: MOOSONEE, HEARST, KAPUSKASING, COCHRANE, CHAPLEAU, TIMMINS, KIRKLAND LAKE AND GOGAMA)

L.S. MacLEOD, V. JANSONS and A.J. KEIZER

GREAT LAKES FORESTRY CENTRE

CANADIAN FORESTRY SERVICE

GOVERNMENT OF CANADA

1987

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SURVEY HIGHLIGHTS

The 1986 field season was highlighted by several major changes in insect populations within the region. On the positive side, extensive reductions in size and intensity of both spruce and jack pine budworm infestations occurred. Moderate-to-severe defoliation by the spruce budworm in the Hearst District declined from 1,173,734 ha in 1985 to 32,384 ha in 1986. Foliar damage by the jack pine budworm was confined to the Chapleau and Gogama districts and the infested area decreased from a total of 955,755 ha in 1985 to 93,469 ha in 1986. Infestation forecasts suggest that this trend will continue in 1987.

Major defoliators of deciduous stands were the forest tent caterpillar and the large aspen tortrix. The tent caterpillar infestations in the Kirkland Lake and Gogama districts expanded considerably, and several small infestations were recorded in the Chapleau District. New infestations of the aspen tortrix were mapped in the Chapleau and Gogama districts and the birch leafminer again caused severe foliar damage in white birch stands at many locations.

Pheromone trapping to monitor the distribution of gypsy moth has been conducted in provincial parks annually since 1979. The first positive capture in the region was recorded at Nagagamisis Provincial Park, Hearst District in 1984. In 1986, a single moth was recovered from each of the following provincial parks: Mississagi Wild River and Wakami in the Chapleau District, and Kap-Kig-Iwan in the Kirkland Lake District. Other special projects included pheromone trapping for the spruce budworm and black army cutworm and surveys to establish the presence of the pinewood nematode.

The effects of weather extremes were reflected in foliar damage over large sections of the region. Severity of damage varied considerably with tree species and geographic location but was evident to some degree in all districts. The regular surveillance for forest diseases was supplemented by a special survey of black spruce plantations and by monitoring plots for the effects of acid precipitation.

The generous assistance and cooperation of Ontario Ministry of Natural Resources and woods industry personnel in all districts of the region are gratefully acknowledged.

The same format was followed in categorizing forest pests as in the 1985 Northern Region report.

Frontispiece. Top and whole-tree mortality of semimature jack pine (*Pinus banksiana* Lamb.) induced by severe feeding of the jack pine budworm, *Choristoneura pinus pinus* Free.

Major Insects/Diseases

capable of causing serious injury to or death of living trees or shrubs

*Minor Insects/Diseases**

capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs

Other Forest Insects/Diseases (Tables)

These tables provide information on two types of pest:

(1) those that are of minor importance and have not been known to cause serious damage to forest trees;

(2) those that are capable of causing serious damage but, because of low populations or for other reasons, did not cause serious damage in 1986.

*No minor insects were reported in the Northern Region in 1986.

L.S. MacLeod

V. Jansons

A.J. Keizer

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(All districts)

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INSECTS

Major Insects

Black Army Cutworm, *Actebia fennica* (Tausch.)

Recent outbreaks of the black army cutworm in conifer seedlings planted on sites prepared by prescribed burning have necessitated careful monitoring for cutworm populations. Pheromone trapping with the "Multi Pher" trap containing synthetic lures to attract male moths was continued on prescribed burns and on one accessible wildfire site in four districts (Table 1). Two traps were placed at widely separated locations on each site soon after the burn was completed and were monitored until late September. Cutworm damage in 1986 was confined to herbaceous ground cover and no significant damage to seedlings on the burns or at other points in the region was observed.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)

For the first time since 1975 this insect was found in outbreak proportions in the region (see photo page). It is possible that the infestation was the result of flights of adults from current infestations in the Sault Ste. Marie and Espanola districts in the Northeastern Region. The largest infestation occurred in the southern part of Chapleau District and covered 215,535 ha (Fig. 1). Moderate-to-severe defoliation of trembling aspen (*Populus tremuloides* Michx.) was also mapped in the southern part of the Gogama District, where 43,745 ha were infested. Defoliation ranged up to 90% in many areas and in some instances part of the feeding was attributed to the aspen twoleaf tier, *Enargia decolor* (Wlk.) (see photo page), and to the forest tent caterpillar, *Malacosoma disstria* Hbn.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Results of damage surveys, population sampling and egg-mass counts of the spruce budworm will be published with those of other regions at a later date in a report specifically devoted to this insect. The report will provide a complete description and analysis of developments in the spruce budworm situation in Ontario in 1986 and will give infestation forecasts for the province for 1987.

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

The area infested by the jack pine budworm in the region decreased sharply in 1986. Moderate-to-severe defoliation over 93,469 ha represented a 90.2% decrease from the 955,755 ha defoliated in 1985. The infestation in Kirkland Lake District collapsed completely and moderate-to-severe defoliation was restricted to the Chapleau and Gogama districts, where 60,929 ha and 32,540 ha, respectively, were affected (Fig. 2).

Table 1. Summary of the results of pheromone trapping for the black army cutworm in four districts of the Northern Region in 1986.

Location (Twp)	Date of burn	Date traps set	Date traps collected	Date traps checked	No. of adults
Gogama District					
Dublin (P.B.)	27-4-86	1-6-86	24-9-86	8-6 to 8-9	290
Asquith (Wildfire)	25-5-86	6-6-86	24-9-86	8-6 to 8-9	18
Garibaldi (P.B.)	22-8-86	23-8-86	24-9-86	3-9 to 22-9	01
Cochrane District					
Potter (P.B.)	24-7-86	14-8-86	17-9-86	—	11
Agatha (P.B.)	20-8-86	27-8-86	17-9-86	—	11
Hearst District					
McEwing (P.B.)	29-7-86	31-7-86	12-9-86	29-8 to 12-9	175
Twp 238 (P.B.)	23-7-86	13-8-86	12-9-86	25-8 to 12-9	40
Kapuskasing District					
Teetzel (P.B.)	28-8-85	18-7-86	16-9-86	28-7 to 16-9	161
Nansen (P.B.)	27-8-85	28-7-86	19-9-86	30-7 to 19-9	103

Note: While no correlation has been made between the size of moth captures and infestations that might develop subsequently, the areas in which higher moth captures were made will be rechecked in 1987.

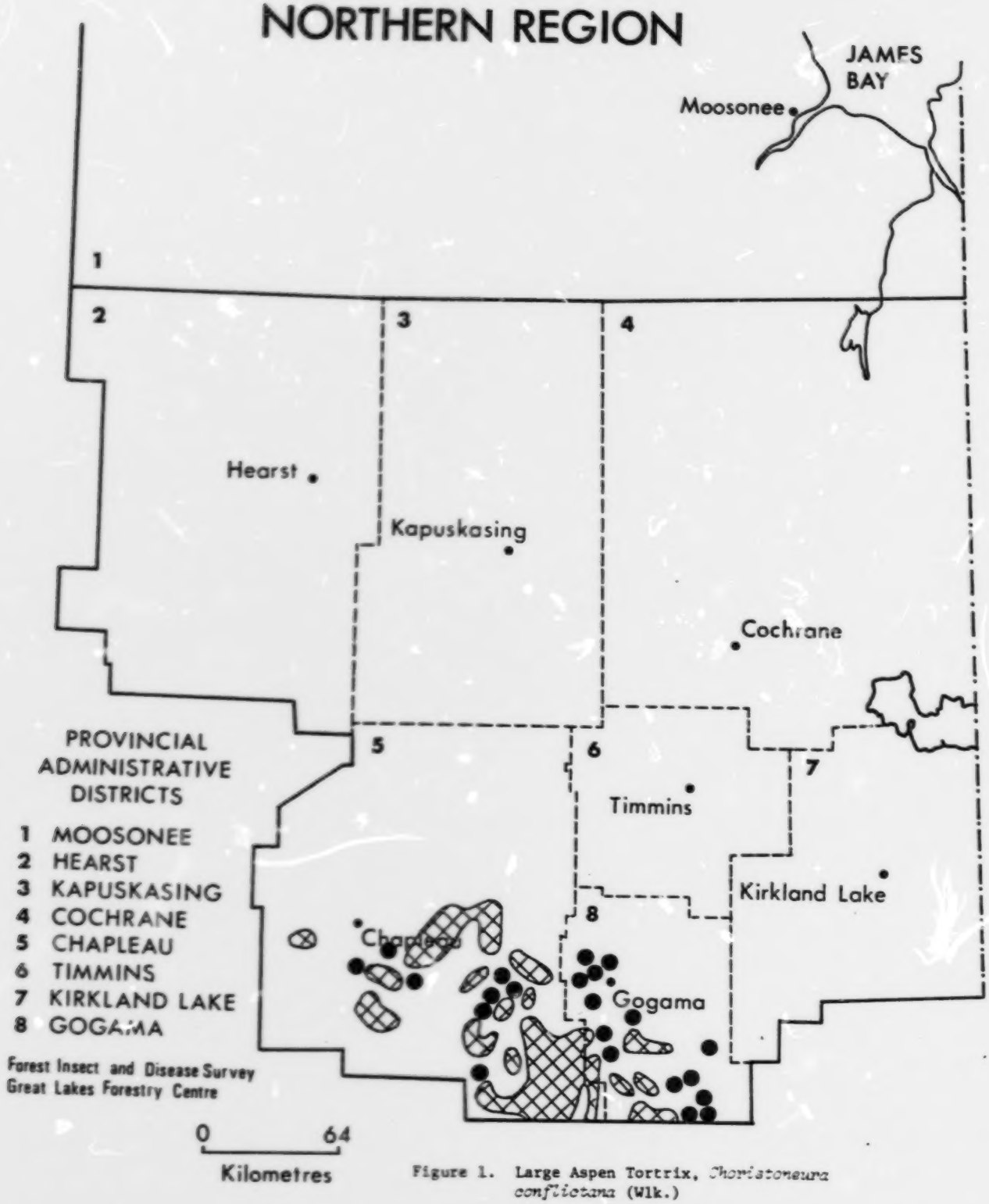


Figure 1. Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)

Areas within which moderate-to-severe defoliation of trembling aspen occurred in 1986

Moderate-to-severe ▨ or ●

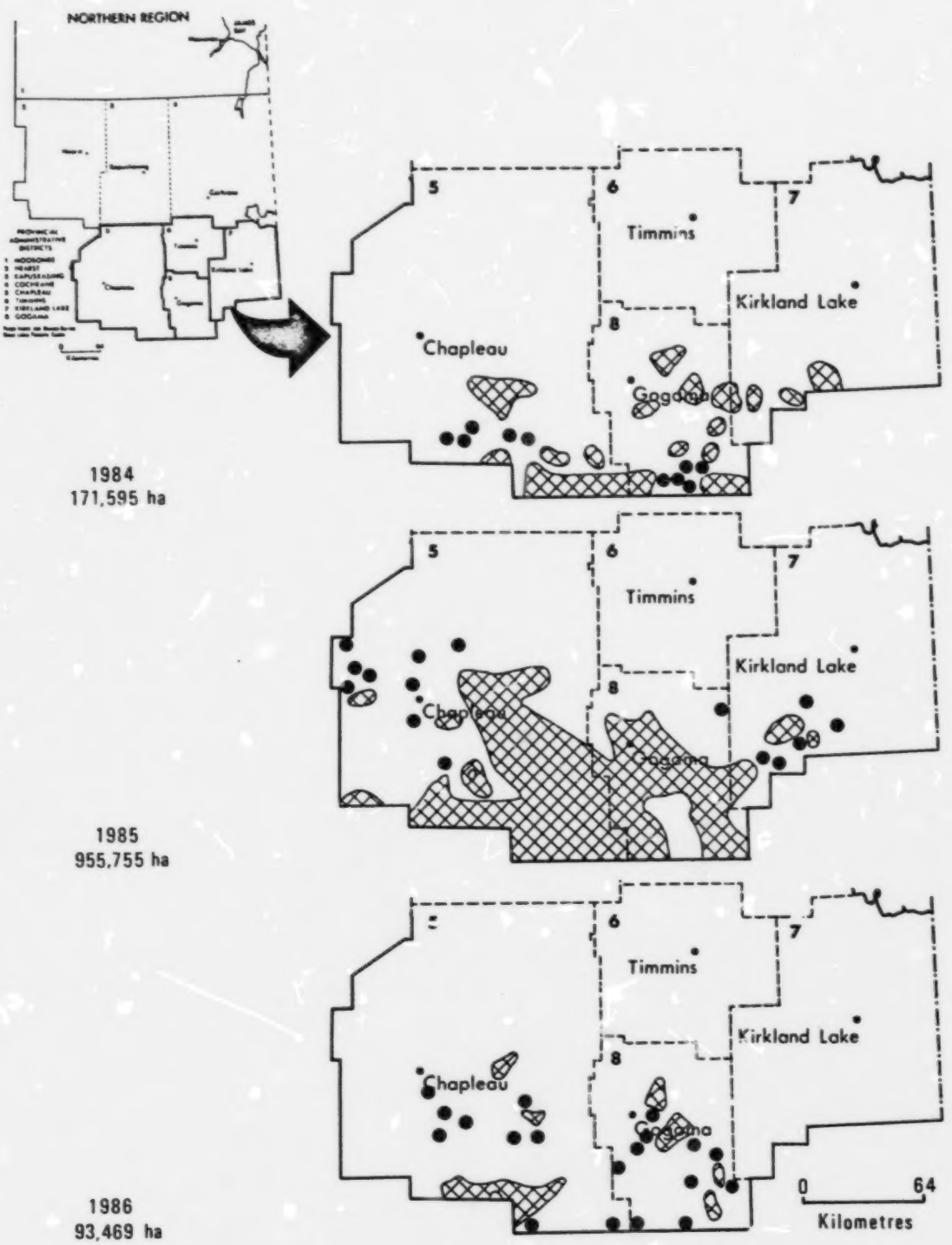


Figure 2. Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Areas within which defoliation of jack pine occurred in 1984-1986

Moderate-to-severe ▨ or ●

High-value stands were again treated with the biological control agent, *Bacillus thuringiensis (B.t.)*. A total of 84,808 ha was sprayed with Dipel 132, a registered formulation of *B.t.*, at an application rate of 20 BIU/1.6 ha. Few larvae were found during post-spray surveys and defoliation was light in most areas.

After two or three consecutive years of moderate-to-severe defoliation of jack pine (*Pinus banksiana* Lamb.), top and/or whole-tree mortality (see photo page) is evident over 8,666 ha (Table 2). The larger area of damage (7,234 ha) occurred in the Gogama District, and the remainder (1,432 ha) was found in the Chapleau District (Fig. 3). Ground surveys showed a range of 1-5% whole-tree mortality and 1-71% top mortality (Table 3). Most mortality occurred in unprotected stands containing less than 40% jack pine, i.e., low-priority stands outside of designated spray blocks (see Frontispiece).

Egg-mass sampling to forecast 1987 populations was carried out at 89 locations through the region. The results of this survey indicate a further reduction in the intensity of the infestation in 1987 (Table 4).

Eastern Pine Shoot Borer, *Eucosma gloriola* Heinr.

Populations of this shoot borer showed little change from those observed in 1985. Infested leaders were found in jack pine plantations through the four southern districts of the region where quantitative sampling was carried out at widely separated locations (Table 5). Of 15 stands evaluated only two showed no leader damage in 1986.

Birch Leafminer, *Fenusa pusilla* (Lep.)

Discoloration and defoliation of white birch (*Betula papyrifera* Marsh.) trees by this introduced leafminer were again prevalent in all districts of the region. Groups of immature and mature trees showing moderate-to-severe damage were readily detected during aerial surveys. Damage to ornamental and shade trees in urban areas continued to increase and gave rise to numerous calls for information on control of the insect. Severe foliage mining recurred in the towns of Iroquois Falls, Cochrane, Hearst and Kapuskasing, where ornamentals were heavily damaged in 1985. Foliar damage was also severe in urban areas in Chapleau and Gogama districts. Sporadic mining was general in Timmins and Kirkland Lake districts. Groups of trees ranging from 10 to 100 in the Elk Lake, Charlton, Englehart and Earlton areas, Kirkland Lake District, sustained up to 80% defoliation. Moderate-to-severe damage on ornamental white birch trees was also recorded in the towns of Larder Lake, Kirkland Lake, Matheson, South Porcupine and Timmins.

Table 2. Summary of jack pine top and/or whole-tree mortality caused by the jack pine budworm in two districts of the northern region in 1986.

Location (Twp)	Area mapped (ha)
Chapleau District	
Breadner	115
Cassidy	375
Cortez	286
Drea	268
Shipley	165
Wakami	106
Wakami	117
Total	1,432
Gogama District	
Amyot	60
Amyot	154
Amyot	99
Battersby	87
Beulah	358
Browning	318
Champagne	380
Garibaldi	76
Garvey	191
Garvey	64
Garvey	59
Garvey	45
Garvey	74
Garvey	173
Hodgetts/Unwin	245
Jack	962
Lampman	71
Londonderry	89
Marshay	622
Marshay	294
Mattagami	412
Mattagami	114
Noble	488
Noble	71
Noble	250
Noble	190
Noble	49
Noble	82

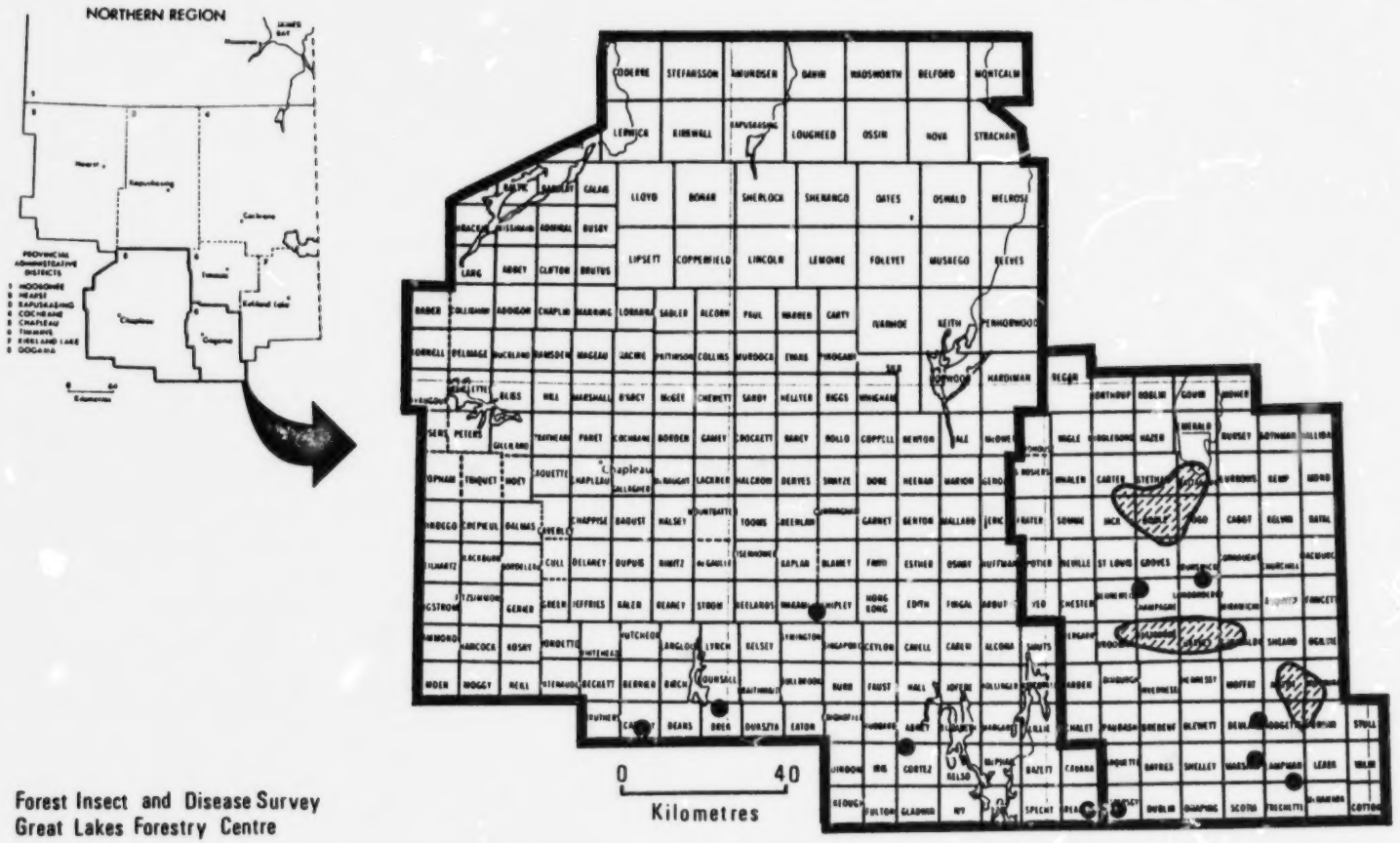
(cont'd)

Table 2. Summary of jack pine top and/or whole-tree mortality caused by the jack pine budworm in two districts of the northern region in 1986 (concl.).

Location (Twp)	Area mapped (ha)
Gogama District (concl.)	
Togo	116
Vrooman	115
Vrooman	14
Vrooman	33
Vrooman	193
Westbrook	506
Westbrook	90
Westbrook	29
Westbrook	27
Westbrook	34
Total	7,234

Table 3. Summary of top and/or whole-tree mortality in jack pine stands in two districts of the northern region, 1985 and 1986.

Location (Twp)	Whole-tree mortality (%)		Top mortality (%)	
	1985	1986	1985	1986
Chapleau District				
Kaplan	0	0	0	7
Wakami	0	0	0	1
Gogama District				
Beulah	0	5	0	71
Mattagami	0	5	0	42
Westbrook	0	2	0	27
Garvey	0	1	0	23
Westbrook (Airstrip road)	0	0	0	23
Champagne	0	1	0	17
Noble	0	0	0	16
Marshay	0	0	0	12



Forest Insect and Disease Survey
Great Lakes Forestry Centre

Figure 3. Jack Pine Mortality

Areas within which top and/or whole-tree mortality occurred in 1986 . . . ▨ or ●

Table 4. Northern Region - Jack pine budworm: Summary of defoliation estimates and egg-mass counts in 1986 and infestation forecasts for 1987.

Location	Estimated % defoliation 1986	Total no. of egg masses on six 61-cm branch tips	Standard infestation forecasts for 1987[a]	Modified infestation forecasts for 1987[a,b]
Chapleau District (45 locations)				
Arbutus Twp - Stand 46	3	0	N	N
Birch Twp - Block 28 (Stand 7)	17	2	L	L
Chappise Twp - Stand 109	0	0	N	N
Cortez Twp - Stand 48	10	1	L	L
- Impact Plot (Stand 197)	0	1	L	L
Crockett Twp - Stand 374	11	0	N	N
Deans Twp - Stand 72	28	2	L	L
- Stand 143	24	1	L	L
deGaulle Twp - Stand 206	21	1	L	L
Denyes Twp - Stand 3	0	0	N	N
Drea Twp - Stand 108	53	0	N	N
Dukszta Twp - Stand 137	32	0	N	N
Eaton Twp - Stand 104	31	1	L	L
Earl Twp - Block 73 (Stand 327)	1	1	L	L
Edith Twp - Plantation 213	24	1	L	L
- Stand 16	8	0	N	N
Eisenhower Twp - Stand 415	0	0	N	N
Fawn Twp - Plantation 177	6	0	N	N
- Stand	30	0	N	N
Gladwin Twp	1	1	L	L
Guindon Twp	48	0	N	N
Halcrow Twp - Stand 137	15	0	N	N
Hall Twp - Stand 300 - Block 45	3	1	L	L
Iris Twp	2	0	N	N
Ivy Twp	1	0	N	N
Kaplan Twp - Stand 353	3	1	L	L
Kelso Twp	29	0	N	N
Lackner Twp - Stand 30	0	0	N	N
Langlois - Block 27 (Stand 157)	5	2	L	L
Margaret Twp	0	0	N	N
McNaught Twp - Stand 235	3	0	N	N
Moggy Twp	24	1	L	L
Neelands Twp - Impact Plot (Stand 54)	3	1	L	L
- Stand 126	0	0	N	N
- Stand 238	7	0	N	N

(cont'd)

Table 4. Northern Region - Jack pine budworm: Summary of defoliation estimates and egg-mass counts in 1986 and infestation forecasts for 1987 (cont'd).

Location	Estimated % defoliation 1986	Total no. of egg masses on six 61-cm branch tips	Standard infestation forecasts for 1987[a]	Modified infestation forecasts for 1987[a,b]
Chapleau District (cont'd) (45 locations)				
Nimitz Twp - Stand 133	15	.1	L	L
- Research Plot (Stand 140)	28	2	L	L
Panet Twp - Research Plot (Stand 89)	0	0	N	N
Peters Twp - Stand 141	1	0	N	N
Raney Twp - Stand 315	3	0	N	N
Shipley Twp - Block 19 (Stand 50)	0	0	N	N
Smuts Twp - Stand 36	7	2	L	L
Strom Twp - Stand 130	2	2	L	L
Topham Twp - Stand 10	0	0	N	N
Wakami Twp - Stand 15	0	0	N	N
Gogama District (33 locations)				
Amyot Twp - Stand 80	0	0	N	N
Benneweis Twp - Stand 175	0	0	N	N
Beulah - Stand 60	3	0	N	N
Brunswick Twp - Stand 31	5	0	N	N
Carter Twp - Block 11 (Stand 249)	2	3	M	L
Churchill Twp - Stand 198	0	0	N	N
Connaught Twp - Stand 117	17	0	N	N
- Stand 122	11	0	N	N
Dublin Twp	5	0	N	N
Frechette Twp - Stand 111	2	1	L	L
Garvey Twp - Block 38 (Stand 323)	0	0	N	N
Invergarry Twp - Impact Plot 14 (Stand 86)	10	0	N	N
- Impact Plot 53 (Stand 98)	10	0	N	N
Jack Twp - Spray Plot 12 (Stand 121)	5	0	N	N
Lampman Twp - Stand 297	68	2	L	L
Londonderry Twp - Stand 150	0	2	L	L
MacMurchy Twp - Stand 127	0	0	N	N
Mattagami Twp - Stand 111	2	1	L	L
McNamara Twp - Stand 129	6	1	L	L
Miramichi Twp - Stand 156	1	0	N	N

(cont'd)

Table 4. Northern Region - Jack pine budworm: Summary of defoliation estimates and egg-mass counts in 1986 and infestation forecasts for 1987 (cont'd).

Location	Estimated % defoliation 1986	Total no. of egg masses on six 61-cm branch tips	Standard infestation forecasts for 1987[a]	Modified infestation forecasts for 1987[a, b]
Gogama District (cont'd) (33 locations)				
Noble Twp - Block 114 (Stand 34)	12	0	N	N
- Stand 62	2	1	L	L
Oglivie Twp - Stand 65	29	2	L	L
- Impact Plot (Stand 137)	0	0	N	N
Roblin Twp - Stand 101	0	0	N	N
Scotia Twp - Stand 263	0	3	M	L
Sheard Twp - Stand 124	3	0	N	N
Stetham Twp - Stand 226	3	0	N	N
Togo Twp - Stand 36	16	1	L	L
Unwin Twp - Stand 76	0	0	N	N
Vrooman Twp - Block 117 (Stand 34)	8	1	L	L
Westbrook Twp - Block 50 (Stand 11)	0	0	N	N
- Impact Plot (Stand 31)	7	0	N	N
Hearst District (1 location)				
Franz Twp	20	1	L	L
Kirkland Lake District (7 locations)				
Bannockburn Twp - Stand 90	0	0	N	N
Charters Twp - Stand 82	0	0	N	N
Corkill Twp - Stand 143	0	1	L	L
Lawson Twp - Stand 33	0	0	N	N
McCann Twp - Stand 70	0	0	N	N
Mickle Twp - Stand 203	0	0	N	N
Willet Twp - Stand 133	0	0	N	N

(cont'd)

Table 4. Northern Region - Jack pine budworm: Summary of defoliation estimates and egg-mass counts in 1986 and infestation forecasts for 1987 (concl.).

Location	Estimated % defoliation 1986	Total no. of egg masses on six 61-cm branch tips	Standard infestation forecasts for 1987[a]	Modified infestation forecasts for 1987[a, b]
Timmins District (3 locations)				
Cleaver Twp	0	0	N	N
Evelyn Twp	0	0	N	N
McKeown Twp	0	0	N	N

[a] N = nil, L = light, M = moderate, H = heavy

[b] Modified Infestation Forecasts

During the last major jack pine budworm outbreak in Ontario, the following standard jack pine defoliation forecast was developed:

Total egg masses on six 60-cm tips (Year X)	Defoliation forecast (Year X + 1)	Defoliation % (Year X + 1)
0	0	0
1-2	light (L)	1-25
3-5	moderate (M)	26-75
6+	severe (S)	76+

This relationship was found to be reliable during the first year or two of the current jack pine budworm outbreak, but in older infestations (3-4 years) it generally overestimated the defoliation potential. The "modified infestation forecast" presented in these tables is based on analysis of egg-mass counts and subsequent defoliation for 1984, 1985 and 1986 from northwestern and northeastern Ontario. The reasons for modifying the forecast are related to an increase in parasitism rates and a reduction in the production of male flowers.

Table 5. Summary of leader damage caused by the eastern pine shoot borer in four districts of the Northern Region in 1986 (counts based on the examination of 150 randomly selected jack pine trees at each location).

Location (Twp)	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Leaders killed (%)
Chapleau District				
Dalmas	2.3	1,600	80	5.0
Cosens	3.0	1,500	100	0.6
Esther	2.7	1,500	168	1.3
Arbutus	2.5	1,000	170	0.6
Peters	2.5	1,200	60	1.0
Gilliland	2.0	2,666	60	3.3
Gogama District				
Invergarry	1.8	1,100	100	2.0
Invergarry	3.1	1,600	100	1.3
Kirkland Lake District				
Skead	2.8	2,500	10	2.4
Ben Nevis	1.0	3,000	10	1.1
Michie	1.7	3,000	10	1.2
Timmins District				
Adams	2.0	2,500	50	5.0
Robb	2.3	2,500	100	3.0

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Several changes occurred in the forest tent caterpillar infestations in the region in 1986.

The Painkiller Lake infestation northeast of Matheson, Kirkland Lake District, subsided abruptly, and although colonies of caterpillars were common through the area in the spring, little defoliation of the principal host species, trembling aspen, developed. Aerial mapping disclosed only two small areas of light defoliation in Carr Township.

The Gowganda-Shiningtree infestation encompassed an area of 51,555 ha in the Kirkland Lake and Gogama districts, representing a major increase in this outbreak (Fig. 4). Defoliation within this area was generally severe.

The Earlton-New Liskeard infestation in the southeastern part of the Kirkland Lake District continued unabated and approximately 87,550 ha of forested land sustained moderate-to-severe defoliation. This infestation extended southward into the Temagami and North Bay districts and many kilometres eastward into the province of Quebec.

Twenty-three smaller infestations totalling 5,545 ha in the Gogama District and 1,725 ha in the Chapleau District were also mapped in 1986. It is probable that many of these will expand considerably in 1987.

Parasitism checks in the older infestation in the Kirkland Lake District showed pupal mortality of 50, 38 and 40% in Henwood, Casey and Ingram townships, respectively. Since heavy moth flights occurred in the infested areas it is assumed that survival was sufficient to cause serious defoliation in 1987. This observation is supported by forecasts based on egg band counts (Table 6, Fig. 5).

Whitespotted Sawyer Beetle, *Monochamus scutellatus* (Say)

Recent forest fires and logging operations tend to attract large numbers of sawyer beetles (see photo page). In 1986 a heavy infestation of adult beetles killed approximately 10 ha of 15-m semimature jack pine trees at the Ostrim Mill debarking site in Westbrook Township, Gogama District.

Jack Pine Sawflies, *Neodiprion pratti banksianae* Roh., *N. virginianus* complex and *N. swainei* Midd.

Populations of the genus *Neodiprion* were much lower in forested areas of the region than in 1985 and damage was relatively insignificant. In the Chapleau district colonies of *N. pratti banksianae* caused approximately 10% defoliation at one location in Chapleau Township and in Shoals and Wakami provincial parks. Light defoliation of scattered

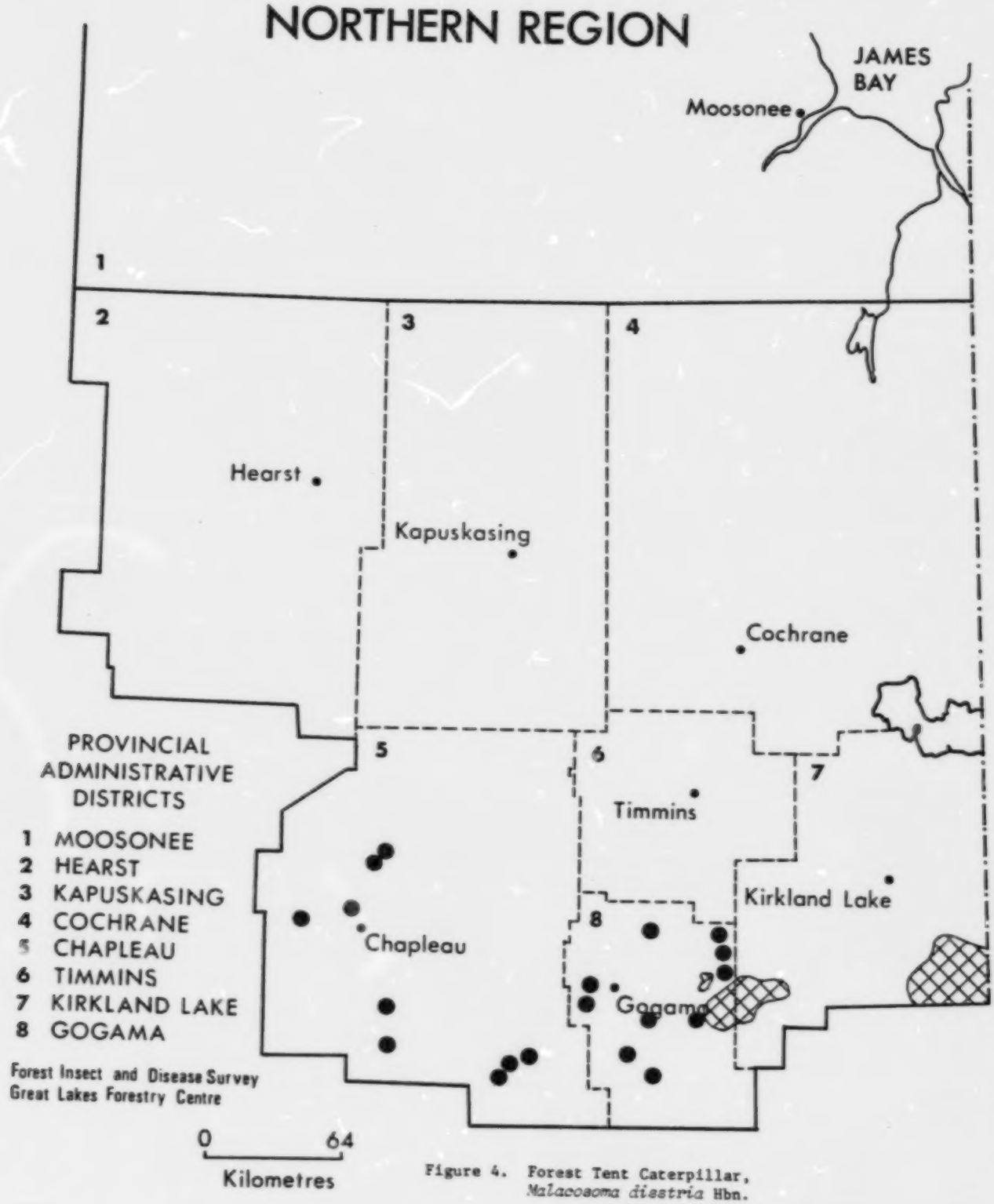


Figure 4. Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Areas within which moderate-to-severe defoliation of trembling aspen occurred in 1986

Moderate-to-severe ▨ or ●

Table 6. Summary of forest tent caterpillar egg-band counts on trembling aspen in three districts of the Northern Region in 1986 and infestation forecasts for 1987.

Location (Twp)	Avg DBH of trees (cm)	No. of trees sampled	Total no. of egg bands	Infestation forecasts for 1987
Kirkland Lake district				
Armstrong	5	1	13	heavy
Cane	15	3	6	light
Beatty	15	3	0	nil
Carr	15	3	1	nil
Hislop	14	3	0	nil
Nicol	9	1	19	heavy
Milner	12	1	57	heavy
Tyrrell	8	1	14	heavy
Evanturel	9	1	40	heavy
Brethour	8	1	68	heavy
Chapleau District				
Racine	20	1	15	heavy
Peters	12	3	5	light
Gogama District				
Fawcett	15	3	1	trace
Macmurchy	21	1	68	heavy
Churchill	24	1	17	heavy

trees by this species was also recorded in Jack and Dublin townships, Gogama District, and at one point in Mountjoy Township, Timmins District.

N. virginianus complex caused approximately 15% defoliation of jack pine trees in the 8-m height class along Highway 101 in Caouette Township, Chapleau District. A few colonies were also found at one point in Fournier Township and at Iroquois Falls in the Cochrane District.

The former *N. swainei* infestation in the Elk Lake Management Unit in the southern part of the Kirkland Lake District has collapsed. The area was surveyed by helicopter in early September, 1986. No defoliation was visible from the air and subsequent ground checks failed to locate any colonies of the sawfly in the area.

Figure 5. Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Locations of egg-band samples taken in 1986 . . . . . ■

Aspen Leafblotch Miner, *Phyllonorycter ontario* (Free.)

Populations of this leafmining insect remained high in the Hearst, Kapuskasing and Cochrane districts. Pockets of moderate-to-severe foliar damage occurred on young trembling aspen and balsam poplar (*Populus balsamifera* L.) trees along roadsides and in regeneration-size stands through the southern part of the Cochrane District, through the central part of the Kapuskasing District and along Highway 631 in the Hearst District. Numerous small infestations were observed elsewhere in these districts. Similar situations were general in the Timmins and Kirkland Lake districts where late summer surveys disclosed heavy mining of aspen regeneration. Chapleau and Gogama districts were relatively free of damage by the leafminer in 1986.

Yellowheaded Spruce Sawfly, *Pikonema alaskensis* (Roh.)

For several years fluctuating sawfly populations caused varying degrees of damage to white spruce (*Picea glauca* [Moench] Voss) and black spruce (*P. mariana* [Mill.] B.S.P.) plantations, snowhedges and ornamental trees in most districts of the region.

Generally, damage was less severe than in 1985 through the districts of Hearst, Kapuskasing and Cochrane. Defoliation averaged 10% in a 0.5-ha black spruce plantation in Fournier Township, Cochrane District and in an 8-year-old white spruce plantation in Way Township, Hearst District. Similar defoliation of open-grown trees of both species was recorded in Fauquier, O'Brien and Nansen townships, Kapuskasing District, and in Clute Township, Cochrane District. Light top and whole-tree mortality, caused by repeated defoliation in recent years, was noted in O'Brien Township, Kapuskasing District and in Calder Township, Cochrane District.

Similar damage to spruce in both forest and urban situations was common through Timmins and Kirkland Lake districts. White spruce trees in old fields and along roads sustained defoliation ranging from 10 to 90% in the Shillington-Matheson-Ramore areas of the Kirkland Lake District. Black spruce trees in a 340-ha plantation in Stock Township, Timmins District were again sporadically defoliated. Approximately 8% mortality was recorded in one section of this plantation.

Defoliation ranging up to 25% was noted at many locations in Chapleau and Gogama districts. Damage was particularly evident in Morin Village, Westree and Shiningtree and on the Mattagami Indian Reserve in Gogama District.

White Pine Weevil, *Pissodes strobi* (Peck)

This perennial pest of pine and spruce plantations (see photo page) caused conspicuous leader mortality through the districts of Chapleau, Gogama, Timmins and Kirkland Lake (Table 7). Damage was much lower in Hearst, Kapuskasing and Cochrane districts.

Table 7. Summary of damage caused by the white pine weevil in six districts of the Northern Region in 1986 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Host	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Leaders killed (%) 1986
Chapleau District					
Dalmas	jP	2.7	1,600	80	26.0
Cosens	jP	3.0	1,500	100	2.0
Esther	jP	2.7	1,500	168	16.0
Arbutus	jP	2.5	1,000	170	14.0
Peters	jP	2.5	1,200	60	6.0
Gilliland	jP	2.0	1,666	60	10.0
Gogama District					
Invergarry	jP	2.0	2,000	100	31.3
Invergarry	jP	1.8	1,111	100	42.0
Invergarry	jP	3.1	1,600	100	1.3
Jack	jP	3.5	4,000	60	2.1
Kirkland Lake District					
Skead	jP	2.8	2,500	10	8.6
Ben Nevis	jP	1.0	4,000	10	4.0
Michie	jP	1.8	4,000	10	37.0
Gross	jP	1.3	4,000	10	11.3
Timmins District					
Robb	jP	2.0	4,500	100	4.0
Turnbull	jP	0.5	5,000	50	4.5
Kapuskasing District					
Fauquier	bS	2.4	500	1	3.3
Hearst District					
Lowther	wS	1.4	1,000	5	0.7

Larch Sawfly, *Pristiphora erichsonii* (Htg.)

Surveys of tamarack *(Larix laricina* [Du Roi] K. Koch) stands in 1985 revealed scattered colonies of larch sawfly in Hearst. Timmins, Kapuskasing, Kirkland Lake and Chapleau districts, indicating the approach of an upward trend in population levels through the region. The expected increase did not develop, and no damage by the sawfly was found in any of the districts in 1986.

Mountain-ash Sawfly, *Pristiphora geniculata* (Htg.)

The downward trend in populations of this sawfly continued for the third consecutive year across the region. Defoliation in forest situations was of little consequence and damage to ornamental mountain-ash trees in urban areas was unusually light.

Table 8. Other forest insects.

Insect	Host(s)	Remarks
Aceria sp. nr. *dispar* (Nalepa) Aspen leaf mite	tA	varying numbers in most districts, particularly conspicuous in stands defoliated by forest tent caterpillar
Acleris variana (Fern.) Eastern blackheaded budworm	wS	low numbers at scattered points in Cochrane, Kapuskasing and Hearst districts
Acrobasis betulella Hlst. Birch tubemaker	wB	light populations in most stands checked in Timmins and Kirkland Lake districts

(cont'd)

Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Adelges lariciatus (Patch) Spruce gall adelgid	wS	high numbers of galls on ornamentals and windbreaks in Timmins and Kirkland Lake districts
Altica ambiens alni Harr. Alder flea beetle	Al	75-100% defoliation of roadside and lakeshore alder at many points in Timmins, Kirkland Lake and Chapleau districts
Anacampsis niveopulvella (Chamb.) Paleheaded aspen leafroller	tA	common in association with other leafrollers through Chapleau and Gogama districts
Aphrophora cribrata (Wlk.) Pine spittlebug	jP	low numbers in most plantations in the region
Aphrophora saratogensis (Fitch) Saratoga spittlebug	jP	low numbers in a 2-m-high plantation at Nellie Lake, Cochrane District, representing a new distribution record
Archips cerasivorana (Fitch) Uglynest caterpillar	pCh	occasional tents through rural and open areas in Kirkland Lake and Timmins districts and in MacMurchy Twp, Gogama District
Arge pectoralis (Leach) Birch sawfly	wB	scattered colonies in Casey, Harley and Kerns twps, Kirkland Lake District
Cecidomyia resinicola (O.S.) (= reeksi Vock.) Jack pine resin midge	jP	light shoot mortality in many plantations through the region
Chionaspis pinifoliae (Fitch) Pine needle scale	jP	lightly infested trees at several points in Argyle Twp, Kirkland Lake District

(cont'd)

Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Chionodes obscurusella Cham. Boxelder leafworm	mM	15% foliage affected on occasional trees in the town of Chapleau
Choristoneura rosaceana (Harr.) Obliquebanded leafroller	Deciduous	low numbers on a wide variety of hosts in Kirkland Lake and Timmins districts
Coleophora laricella (Hbn.) Larch casebearer	tL	2% defoliation on several trees in Fawn Twp, Chapleau District, in Fauquier Twp, Kapuskasing District and in Garvey Twp, Gogama District
Coleotechnites thujaella (Kkt.) Brown cedar leafminer	eC	approximately 20 ha sustained 5-10% defoliation in Warren Twp, Chapleau District
Conophthorus banksianae McPherson Jack pine tip beetle	jP	shoot mortality common through the region; 10% of 2-m trees with dead shoots in Gilliland Twp, Chapleau District
Dendroctonus simplex LeC. Eastern larch beetle	tL	high numbers on two ornamental trees in Shackleton Twp, Kapuskasing District
Dioryctria reniculelloides Mut. & Mun. Spruce coneworm	wS, bS	10% defoliation of two mature trees in Nimitz Twp S.P.A., Chapleau District; common at many points in the southern part of Timmins District and at Nagagamisis Lake, Hearst District
Egira dolosa (Grt.) Lined black aspen caterpillar	tA	found commonly with other aspen defoliators in the Chapleau and Gogama districts

(cont'd)

Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Epinotia solandriana L. Birch-aspen leafroller	wB, tA	contributed substantially to defoliation of birch in Timmins and Kirkland Lake districts; low numbers in Fauquier Twp, Kapuskasing District
Eupareophora parca (Cr ss.) Spiny ash sawfly	bAs	Upper crowns of trees were moderately defoliated at many points in Timmins and Kirkland Lake districts; late frost in Chapleau District reduced numbers and defoliation.
Fenusa dohrnii (Tischb.) European alder leafminer	Al	severe mining at scattered locations in Kapuskasing, Kirkland Lake and Timmins districts
Gilpinia hercyniae (Htg.) European spruce sawfly	wS	small numbers at a few points in Kapuskasing and Kirkland Lake districts
Gonioctena americana (Schaef.) American aspen beetle	tA	moderate-to-severe defoliation of upper crowns in regeneration-type stands in Benoit, Black, Ben Nevis, Holmes, Flavelle, Cairo and McEvay twps, Kirkland Lake District; low numbers elsewhere in the region
Hyphantria cunea (Dru.) Fall webworm	Deciduous	tents common in Marter, Hilliard and Evanturel twps, Kirkland Lake District; rare elsewhere in the region
Malacosoma californicum pluviale Dyar Northern tent caterpillar	Deciduous	colonies common along bush roads and cutovers in Timmins and Kirkland Lake districts; single colonies in Invergarry Twp, Gogama District

(cont'd)

Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Meroptera pravella Grt. Lesser aspen webworm	tA	low numbers common through Timmins and Kirkland Lake districts
Micurapteryx salicifoliella Cham. Willow leafminer	W	90% defoliation at many points through Hearst District and the southern part of Cochrane District
Nematus salicisodoratus Dyar Willow sawfly	W	several colonies in Argyle Twp, Kirkland Lake District
Neodiprion abietis complex Balsam fir sawfly	wS	2% defoliation of several trees in Brower Twp, Cochrane District
Neurotoma inconspicua (Nort.) Plum webspinning sawfly	pCh	single tents in the northern part of Kirkland Lake District and at Wakami Provincial Park, Chapleau District
Nycteola cinereana N. & D. Poplar leaftier	bPo	low numbers wherever regeneration of this species was found through the Chapleau and Gogama districts
Nymphalis antiopa (L.) Mourningcloak butterfly	Deciduous	up to 90% defoliation of small trees at several points through Timmins and Kirkland Lake districts; rare at other points in the region
Paradiplosis tumifex Gagné Balsam gall midge	bF	low numbers on several young trees in Colquhoun Twp, Cochrane District
Paraprociphilus tessellatus (Fitch) Woolly alder aphid	Al	occasional trees heavily infested in Daoust Twp, Chapleau District

(cont'd)

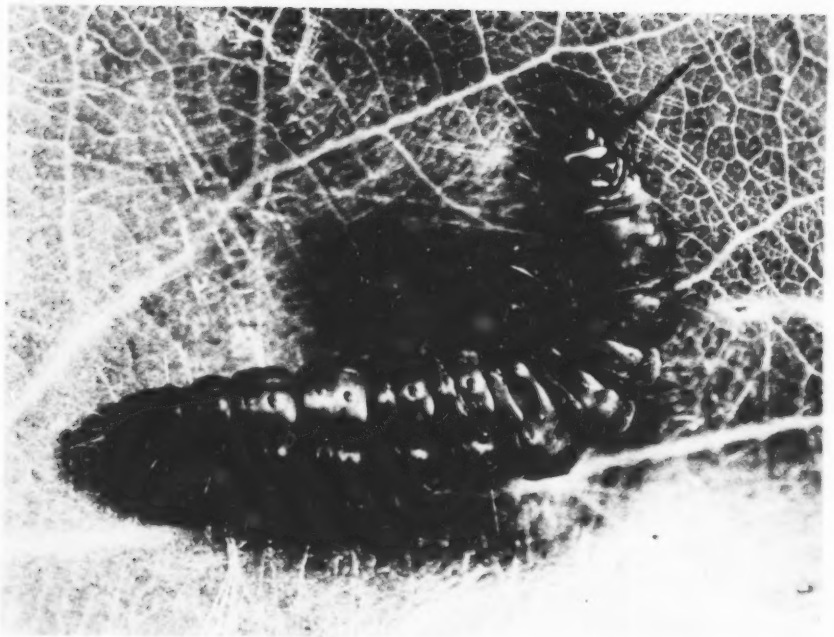
Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Petrova albicapitana (Busck) Northern pitch twig moth	jP	low numbers in most stands surveyed in the region
Phratora purpurea purpurea Brown Aspen skeletonizer	tA	common through the Timmins and Kirkland Lake districts
Pineus similis (Gill.) Ragged spruce gall aphid	wS	low numbers of galls found in Greenwater Provincial Park, Cochrane District and in Fauquier Twp, Kapuskasing District
Pleroneura brunneicornis Roh. (= borealis Felt) Balsam shootboring sawfly	bF	common at many points, particularly in Grenfell, Maisonville and Savard twps, Kirkland Lake District
Pseudexentera oregonana Wlshm. Aspen leafroller	tA	lightly defoliated trees at several locations in the Larder Lake and Swastika areas, Kirkland Lake District and in Fauquier and Opasatika twps, Kapuskasing District
Pyrrhalta cavicollis (LeC.) Cherry leaf beetle	cCh	up to 100% defoliation along 1 km of roadside regeneration in Caouette Twp, Chapleau District
Pyrrhalta tuberculata (Say) Willow leaf beetle	W	90-100% defoliation over 100 ha in the Shillington area, Timmins District, in Barber and Beauchamp twps, Kirkland Lake District, and at several points along Highway 101 in Chapleau District

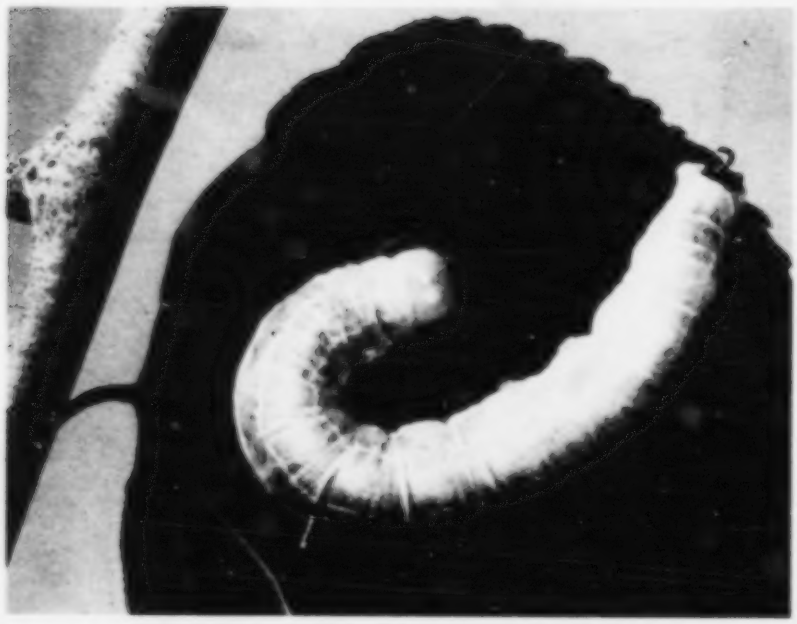
(cont'd)

Table 8. Other forest insects (concl.).

Insect	Host(s)	Remarks
Tetralopha aplastella (Hlst.) Aspen webworm	tA	generally found in aspen stands, especially in Nicol, Milner, Evanturel and Harley twps, Kirkland Lake District
Toumeyella parvicornis (Ckll.) (= numismaticum [P. & M.]) Pine tortoise scale	jP	approximately 0.5 ha heavily infested in Burt Twp, Kirkland Lake District; many single trees lightly infested through the region
Vasates quadripedes Shimer Maple bladdergall mite	siM	high populations on shade trees in the town of Cochrane and in Glackmeyer Twp, Cochrane District
Zelleria haimbachi Busck Pine needle sheathminer	jP	much lower numbers reported through the region than in 1985



Feeding by the large aspen tortrix larva, *Choristoneura conflictana* (Wlk.) (above), can cause severe damage to trembling aspen (*Populus tremuloides* Michx.) (light areas below).



Feeding by the aspen twoleaf tier larva, *Enargia decolor* (Wlk.) (above), can cause considerable damage to trembling aspen (*Populus tremuloides* Michx.) (below).

Typical 'shepherd's crook' terminal damage to jack pine (*Pinus banksiana* Lamb.) (above) is caused by the white pine weevil, *Pissodes strobi* (Peck) (below).

Pinewood nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer)
Nickle, trap logs cut and piled

Attracted to the cut logs are adult whitespotted sawyer beetles, *Monochamus* spp., possible vectors of this disease.

TREE DISEASES

Major Diseases

Armillaria Root Rot, *Armillaria mellea* (Vahl : Fr.) Kummer

This root rot continued to cause moderate tree mortality in plantations and in natural jack pin regeneration through the region. The highest incidence of mortality was recorded in a 75-ha jack pine plantation in Skead Township, Kirkland Lake District where 2.6% of trees evaluated were killed (Table 9). Tree mortality ranged from 0.7% to 2% in other areas examined in the region.

Table 9. Summary of jack pine mortality caused by Armillaria root rot in five districts in the region in 1986 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Current mortality (%)
Chapleau District				
Asquith	3.0	600	56	0.7
Cochrane District				
Avon	1.4	5,000	5	0.7
Bragg	1.4	2,500	20	0.7
Sheldon	1.5	5,000	20	0.7
Hearst District				
Wicksteed	1.3	2,500	10	0.7
Kirkland Lake District				
Doon	0.9	2,990	322	1.3
Skead	2.8	2,500	75	2.6
Timmins District				
Adams	1.1	2,900	20	2.0
Robb	2.9	2,900	50	1.3

Scleroderris Canker, *Ascocalyx abietina* (Lagerb.) Schläpfer-Bernhard

The identification of the European race of this serious disease at several locations in southern Ontario has emphasized the importance of continuing vigilance throughout the region. Intensive surveys carried out in all districts failed to reveal the European race. Samples that were identified as the North American race were recovered on red pine (*Pinus resinosa* Ait.) from Kettle Lakes Provincial Park, Timmins District, and on jack pine from McCool and Michaud townships, Kirkland Lake District, where the organism has been present for many years. Lower-crown branch infections were observed on 3% of 2-m trees examined in a 5-ha red pine plantations in Lloyd Township, Chapleau District. Negative results were recorded at all other locations sampled through the region.

Spruce Needle Rusts, *Chrysomyxa ledi* (Alb. and Schwein.) de Bary var. *ledi* and *C. ledicola* (Peck) Lagerh.

Generally, these rusts were of little importance in white and black spruce stands in 1986. An exception to this situation was noted in Burt Township, Kirkland Lake District, where black spruce trees averaging 3 m in height sustained moderate-to-severe infection in a 0.5-ha area. Although heavy fruiting produced spectacular discoloration, it is unlikely that serious damage to the stand will result. Elsewhere in the region infection levels were low.

Ink Spot of Aspen, *Ciborinia whetzelii* (Seaver) Seaver

Pockets of severely discolored aspen foliage were visible at numerous locations during aerial surveys. However, ground assessments showed relatively light damage when larger stands were evaluated. The highest level of infection was observed in Davidson Township, Kirkland Lake District, where 75% of trees examined were affected and foliar damage reached 25% (Table 10). Occasional pockets of light damage ranging from 1 to 5 ha were observed in Chapleau and Gogama districts.

Western Gall Rust, *Endocronartium harknessii* (J.P. Moore) Y. Hirats.

Stem infections of this rust occurred in high-value 3-0 grafted scion stock at the Chapleau Nursery, Chapleau District, where 19.3% of the estimated 1,500 jack pine were severely galled. Mortality of 3% was recorded in a 0.5-ha plantation of jack pine less than 1 m high in Kimberley Township, Kirkland Lake District and light infection levels were common elsewhere through the region.

Table 10. Summary of damage caused by ink spot of aspen in two districts in the Northern Region in 1986 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Trees affected (%)	Defoliation level (%)
Kirkland Lake District					
Marter	6	900	2	50	15
Skead	2	2,500	2	20	20
Cane	3	1,300	10	35	20
Davidson	7	1,000	3	75	25
Ben Nevis	1	2,900	3	20	15
Harker	2	2,500	10	50	25
Corkill	2	2,900	15	60	30
Carr	6	2,300	2	75	25
Timmins District					
German	4	2,000	2	10	30
English	5	2,200	3	60	25

Hypoxylon Canker, *Hypoxylon mammatum* (Wahlenb.) J. Miller

In 1984, four semipermanent study plots were established in randomly selected mature trembling aspen stands in Kapuskasing, Cochrane and Gogama districts for rating the impact of Hypoxylon canker. In 1986 no changes in infection status were observed in three of the reexamined plots. However, in the plot established in Shanly Township, Kapuskasing District, where one mainstem canker was recorded in 1984 in the upper crown of an infected tree, all branches above it had since died.

Twenty-nine Hypoxylon study plots were established in Chapleau and Kirkland Lake districts and are being monitored by other Forest Disease Survey personnel. Data for these plots will be presented soon.

Shoot Blight, *Venturia macularis* (Fr.) E. Müller & v. Arx

This disease causes current-year shoot mortality and blackening of leaves of young trembling aspen regeneration in cutovers and on fringe trees. In 1986 light damage levels were observed in the southern districts of the region (Table 11).

Table 11. Summary of damage caused by shoot blight in four districts in the Northern Region in 1986 (counts based on the examination of 150 randomly selected trembling aspen trees at each location).

Location (Twp)	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Trees affected (%)	Terminal shoot mortality (%)
Chapleau District					
Kaplan	3.0	5,000	25	20	10
Gallagher	3.5	3,000	20	10	10
Gogama District					
MacMurchy	3.0	2,500	15	15	10
Kirkland Lake District					
Katrine	2.0	5,500	5	80	20
Ben Nevis	2.0	4,000	10	50	10
Pontiac	2.5	3,000	3	50	10
Burt	1.5	5,500	10	25	10
Grenfell	1.0	5,000	1	10	10
Lawson	2.0	3,500	5	50	15
Timmins District					
Stock	2.0	4,000	2	50	10
Hillary	2.0	3,500	2	75	20
Bristol	1.5	5,500	1	50	15
German	1.5	3,000	2	50	5

Table 12. Other forest diseases.

Organism	Host(s)	Remarks
Ceratocystis ulmi (Buism.) C. Moreau Dutch elm disease	wE	no further extension of the range of this disease in the region
Coleosporium asterum (Dietel) Sydow Pine needle rust	jP	very low numbers of infected trees observed in 1986
Coleosporium viburni (Arthur) Pine needle rust	jP	5% foliage infection on six trees 3 m high at Shoals Provincial Park, Chapleau District
Cronartium comptoniae Arthur Sweet fern blister rust	jP	9.3% of trees with stem cankers in Carew Twp, Chapleau District
Davisomycella ampla (J. Davis) Darker Tar spot needle cast	jP	lightly defoliated trees at several points in Cook and Cairo twps, Kirkland Lake District, and in German Twp, Timmins District
Linospora tetraspora G.E. Thompson Linospora leaf blight	bPo	up to 50% defoliation of small stands at numerous locations through the region
Lirula nervata (Darker) Darker Needle cast	bF	40% of old foliage affected on two trees near Pineal Lake, Chapleau District
Phacidium abietis (Dearn.) J. Reid & Cain Snow blight	bF	entire branches discolored on approximately 50% of regeneration in a 1-ha area in Garibaldi Twp, Gogama District
Sarcotrochila balsameae (J. Davis) Korf. Snow blight	bF	severe foliage discoloration on small scattered trees at one point in Fauquier Twp, Kapuskasing District
Scoleconectria cucurbitula (Tode: Fr.) C. Booth Canker and dieback	bF	single-tree mortality common through the region

(cont'd)

Table 12. Other forest diseases (concl.).

Organism	Host(s)	Remarks
Uncinula adunca (Wallr.: Fr.) Lév. Powdery mildew	W	light infections general through Kapuskasing District

ABIOTIC DAMAGE

Frost Injury

Unseasonably warm weather in late May followed by overnight frosts in early June caused varying degrees of damage to young white spruce, balsam fir *(Abies balsamea* [L.] Mill.) and black spruce trees throughout Cochrane, Hearst and Kapuskasing districts and at scattered points in the southern part of the region. The most severe damage recorded was in white spruce plantations in Calder Township, Cochrane District, and in McEvay Township, Kirkland Lake District, where 100% of the trees were affected and 80% and 75%, respectively, of the shoots were killed (Table 13).

New growth of black ash *(Fraxinus nigra* Marsh.) was also completely killed on trees in Asquith and MacMurchy townships, Gogama District, and in Chewett, Sandy, Evans, Manning and Brutus townships, Chapleau District. However, the affected trees refoliated and appear to be in normal vigor.

Table 13. Summary of damage caused by frost in seven districts in the Northern Region in 1986 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Host	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Trees damaged (%)	Foliar damage (%)
Chapleau District						
Brutus	bS	4.5	900	71	9.3	1
Panet	bS	5.0	100	90	9.3	1
Panet	bS	0.4	50	97	17	2
Cochrane District						
Fournier	bS	2.4	2,500	5	76	5
Calder	wS	4.8	2,500	5	78	12
Clute	wS	1.4	1,000	10	100	50
Calder	wS	1.2	1,600	5	100	80
Calder	wS	0.9	1,600	10	100	60
Glackmeyer	wS	1.8	1,600	5	50	20
Gogama District						
Asquith	bS	1.0	1,000	13	17	1

(cont'd)

Table 13. Summary of damage caused by frost in seven districts in the Northern Region in 1986 (counts based on the examination of 150 randomly selected trees at each location) (concl.).

Location (Twp)	Host	Avg ht of trees (m)	Estimated no. of trees per ha	Estimated area affected (ha)	Trees damaged (%)	Foliar damage (%)
Hearst District						
Studholme	wS	1.4	1,600	10	60	10
Lowther	wS	0.8	1,600	10	100	20
Templeton	bF	4.0	1,600	100	80	50
Larkin	bS	0.7	1,200	10	55	10
Kapuskasing District						
Williamson	wS	2.8	2,000	5	90	10
Opasatika	wS	1.2	1,600	10	60	10
Shearer	wS	1.5	2,000	10	20	10
Bourinot	bS	1.5	2,000	10	10	10
Bourinot	bF	2.0	1,000	50	50	20
O'Brien	bS	4.2	2,500	5	40	5
Kirkland Lake District						
Pacaud	bF	1.0	1,100	1	75	60
Tyrrell	bF	1.2	900	0.5	50	40
Flavelle	bF	1.1	600	0.5	40	50
Marriott	bF	2.0	900	1	60	70
Corkill	bF	1.2	1,200	2	75	75
McEvay	wS	1.2	1,600	2	100	75
Timmins District						
Kenogaming	bF	0.9	1,100	2	75	75
Sewell	bF	1.3	1,200	1	25	10
Zavitz	bF	0.9	900	1	40	10

Heat Stress

Nearly 50,000 jack pine seedlings were lost to heat stress during the spring planting of 2-0 bare-root stock in a 40-ha area in Oates Township, Chapleau District.

Wind Damage

Extremely high winds caused widespread damage in the Chapleau and Gogama districts, where a total area of 3,541 ha in 59 separate patches was blown down. The largest single area was in Copperfield Township, Chapleau District, where 844 ha were affected. The most intense damage occurred to forest stands situated along lakeshores and on hilltops and slopes.

Winter Drying

Considerable winter drying was observed on eastern white cedar (*Thuja occidentalis* L.) on about 100 ha along Highway 101 East in Carter, Sandy and Pinogami townships, Chapleau District, where up to 100% of foliage was affected. About 50 ha of the same host were similarly damaged in Asquith and Kelvin townships, Gogama District.

This damage caused conspicuous browning of trees during warm and dry weather in early spring when water loss from the foliage could not be replaced by the frozen root system.

Squirrel Damage

Considerable flagging on jack pine, caused by squirrels, was observed in the Chapleau and Gogama districts. This damage occurs when squirrels tear cones from the twigs, creating wounds. Often the affected twigs die beyond the scar, and red flagging occurs. The highest incidence of this twig mortality was observed in stands of jack pine along the Missinaibi Road in Panet and Marshall townships, Chapleau District, where up to 25% of branches were affected.

High numbers of cones, also pruned by squirrels, were observed beneath scattered white pine (*Pinus strobus* L.) trees along Highway 144 in Edinburgh and Paudash townships, Gogama District.

SPECIAL SURVEYS

Black Spruce Plantations

In 1986 a special survey was again conducted to assess the impact of insect and disease problems in 12 black spruce plantations in the region (Table 14). Stand selection was based on three height classes: <2 m, 2-6 m and >6 m. A random sampling procedure was used and 150 trees were examined in two visits during the periods 9-27 June and 14 July-1 August. The stands were evaluated for the presence of the following selected insects, diseases and abiotic damage:

Insects: spruce budworm, spruce coneworm, yellowheaded spruce sawfly, white pine weevil and sawyer beetles, *Monochamus* spp.

Diseases: Armillaria root rot, spruce needle rust, spruce broom rust, *Chrysomyxa arctostaphyli* Diezel, and eastern dwarf mistletoe, *Arceuthobium pusillum* Peck.

Abiotic Damage: frost

Insect and diseases not found in the current survey:

Insects: sawyer beetles

Diseases: Armillaria root rot, broom rusts and eastern dwarf mistletoe

Miscellaneous insects and diseases not specifically designated as part of the survey were also evaluated, but none caused more than trace damage. They include:

Spruce aphid - *Cinara* spp.

Ragged spruce gall adelgid - *Pineus similis* (Gill.)

Greenheaded spruce sawfly - *Pikonema dimmockii* (Cress.)

Needle cast - *Isthmiella crepidiformis* (Darker) Darker

The special survey of black spruce revealed no serious pest problems, except for frost damage in Larkin Township, Hearst District, O'Brien Township, Kapuskasing District, and Stock Township, Timmins District, where damage ranged from 3% to 10%. Severe frost can kill new shoots and inhibit proper tree growth.

Armillaria root rot was not observed in any of the plots examined.

Table 14. Summary of the results of a special survey of 12 black spruce plantations or high-value stands in the Northern Region in 1986 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Estimated stand area (ha)	Estimated no. of trees per ha	Ht class (m)	Spruce budworm		Yellowheaded spruce sawfly		White pine weevil	Spruce coneworm	
				Trees attacked (%)	Defoliation (%)	Trees attacked (%)	Defoliation (%)	Trees attacked (%)	Trees attacked (%)	Defoliation (%)
Chapleau District										
Asquith	13	1,000	0.5-2.0	6.0	1	0	0	0	2.0	1
Brutus	71	3,000	2.1-6.0	0	0	0	0	0	0	0
Panet	90	100	2.1-6.0	0	0	0.3	1	0	0	0
Panet	97	100	0.5-2.0	4.7	1	0	0	0	0	0
Floranna	76	100	>6.0	0	0	0	0	0	0	0
Gogama District										
Jack	12	3,000	>6.0	0	0	0	0	0	0	0
Cochrane District										
Calder	10	2,500	2.1-6.0	0	0	0	0	0	0	0
Sheldon	10	1,600	0.5-2.0	0	0	0	0	0	0	0
Hearst District										
Eiber	5	2,500	>6.0	0	0	0	0	0	0	0
Larkin	12	1,600	0.5-2.0	0	0	0	0	0	0	0
Kapuskasing District										
Fauquier	1	2,500	>6.0	0	0	0	0	0	0	0
O'Brien	5	2,500	2.1-6.0	0	0	0	0	0	0	0
Kirkland Lake District										
McEvay	5	2,500	>6.0	0	0	0	0	0	0	0
Timmins District										
Stock	520	4,440	2.1-6.0	0	0	0	0	2.0	0	0

(cont'd)

Table 14. Summary of the results of a special survey of 12 black spruce plantations or high-value stands in the Northern Region in 1986 (counts based on the examination of 150 randomly selected trees at each location) (concl.).

Location (Twp)	Estimated stand area (ha)	Estimated no. of trees per ha	Ht class (m)	Frost		Needle rust	
				Trees affected (%)	Foliar damage (%)	Trees affected (%)	Foliar damage (%)
Chapleau District							
Asquith	13	1,000	0.5-2.0	17.3	1	0.7	1
Brutus	71	3,000	2.1-6.0	9.3	1	9.3	1
Panet	90	100	2.1-6.0	9.3	1	11.3	1
Panet	97	100	0.5-2.0	16.7	2	0	0
Floranna	76	100	>6.0	0	0	2.7	1
Gogama District							
Jack	12	3,000	>6.0	0	0	2.0	1
Cochrane District							
Calder	10	2,500	2.1-6.0	0	0	0	0
Sheldon	10	1,600	0.5-2.0	0	0	0	0
Hearst District							
Elber	5	2,500	>6.0	0	0	0	0
Larkin	12	1,600	0.5-2.0	55.0	10	0	0
Kapuskasing District							
Fauquier	1	2,500	>6.0	0	0	0	0
O'Brien	5	2,500	2.1-6.0	40.7	5	0	0
Kirkland Lake District							
McEvay	5	2,500	>6.0	0	0	0	0
Timmins District							
Stock	520	4,440	2.1-6.0	52.6	3	0	0

Black Spruce Seed and Cone Pests

A survey of insects causing damage to black spruce cones and seeds was conducted at five locations in the region in 1986. At each collection point, samples of 100 cones were taken from the total length of the cone-bearing crowns of a minimum of three trees. Cones were collected from upland and lowland sites. Samples were sent to the Great Lakes Forestry Centre (GLFC) for dissection and analysis. It was found that 14-45% of cones were damaged and the seed loss in damaged cones ranged from 50.6 to 70.7% (Table 15).

Gypsy Moth Pheromone Traps

Two traps were set out in each of 12 provincial parks and one private park in the region to detect the presence of gypsy moth, *Lymantria dispar* (L.). The traps, baited with a synthetic pheromone lure, were set out by 15 July and collected in September. In 1986 one adult gypsy moth was captured in each of the following provincial parks: Mississagi Wild River and Wakami, Chapleau District, and Kap-Kig-Iwan, Kirkland Lake District (Fig. 6).

Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

The pinewood nematode (see photo page) is suspected of causing mortality in conifer stands by disrupting water flow within the sapwood of trees. The nematodes are transferred from affected to healthy trees by sawyer beetles, *Monochamus* spp.

In 1985 two forms of the pinewood nematode were positively identified in four samples submitted from Strom Township, and one sample from Hill Township, both in Chapleau District, and from one sample from Westbrook Township, Gogama District (Fig. 7). Surveys to establish distribution of the nematode were continued through the region by sampling damaged or suspect trees and setting out trap logs (see photo page). In 1986, adult sawyer beetles were collected at numerous locations and submitted live to GLFC for examination (Fig. 8). To date, however, identification of 1986 samples has not been completed.

Acid Rain National Early Warning System (ARNEWS)

The three study plots established in the region in 1984 and 1985 were resampled in 1986. All trees on the plots were examined and changes were recorded. Ground cover plants were also examined and compared with those collected in 1985. Off-plot trees were sampled for insect and disease damage. All samples were negative with the exception of the plot in Deans Township, Chapleau District, where light defoliation of jack pine was caused by jack pine budworm.

Table 15. Summary of black spruce seed and cone damage in the Northern Region in 1986.

Location (Twp)	Type of site	No. of cones examined	Damaged cones (%)	Seed loss within damaged cones (%)	Principal cause of seed loss (in order of importance)
Chapleau District					
Sandy	lowland	100	21	47.3	*Lasiomma anthracina* (Czerny) Spruce cone maggot External damage *Mayetiola carpophaga* (Tripp) Spruce seed midge
Gogama District					
Invergarry	upland	100	15	28.5	*Lasiomma anthracina* Minor external damage-crabbing
Kapuskasing District					
Fauquier	lowland	100	30	70.7	*Lasiomma arthracina* *Dasineura rachiphaga* Tripp Spruce axis cone midge
Kirkland Lake District					
Gross	lowland	100	45	50.6	*Lasiomma anthracina* *Dasineura rachiphaga* Lepidopterous larvae *Dasineura canadensis* Felt Spruce cone gall midge
Burt	upland	99	14	16.0	*Lasiomma anthracina* External crabbing *Dasineura rachiphaga*

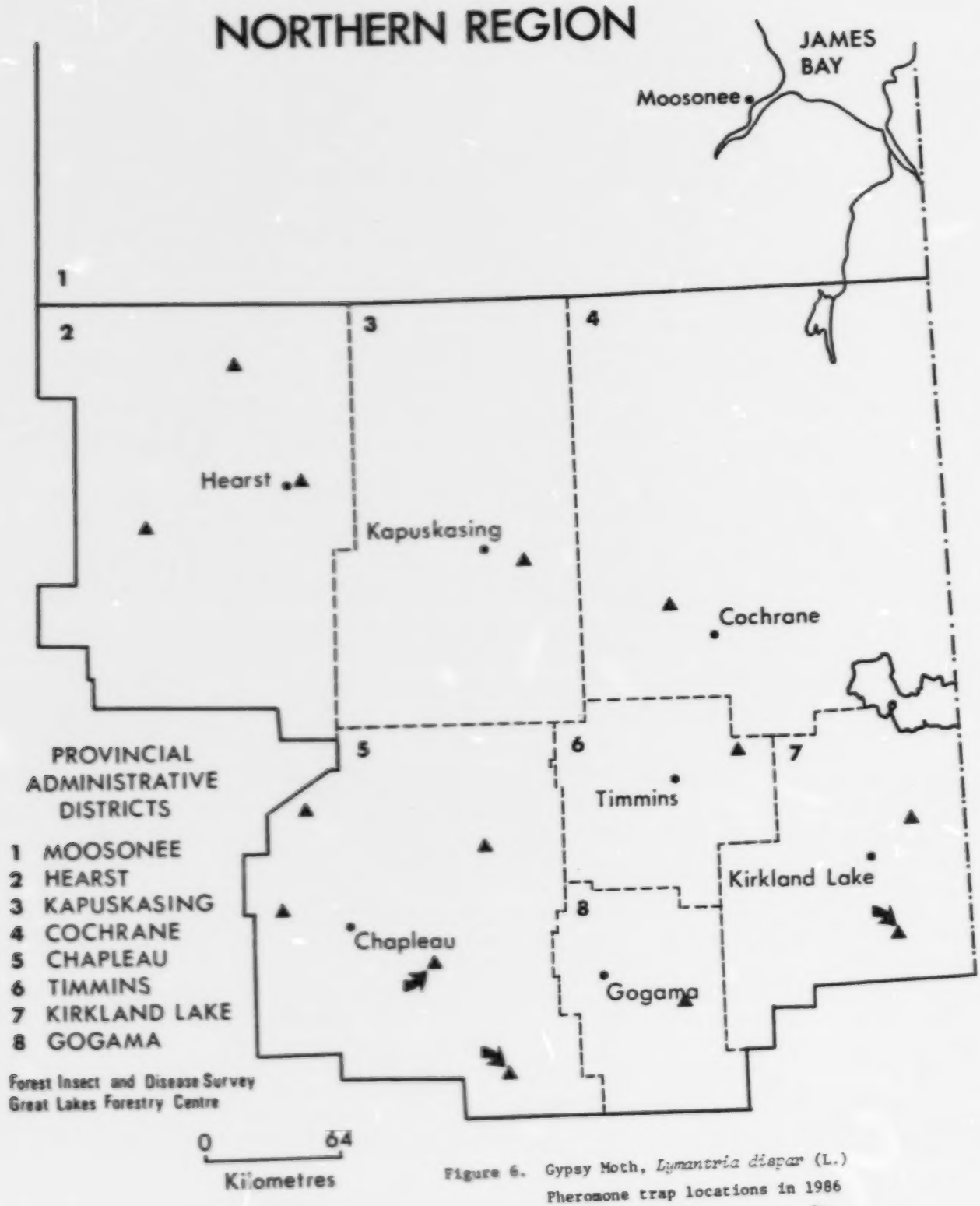


Figure 6. Gypsy Moth, *Lymantria dispar* (L.)
Pheromone trap locations in 1986

Positive traps . . . . . ▲
Negative traps . . . . . ▲

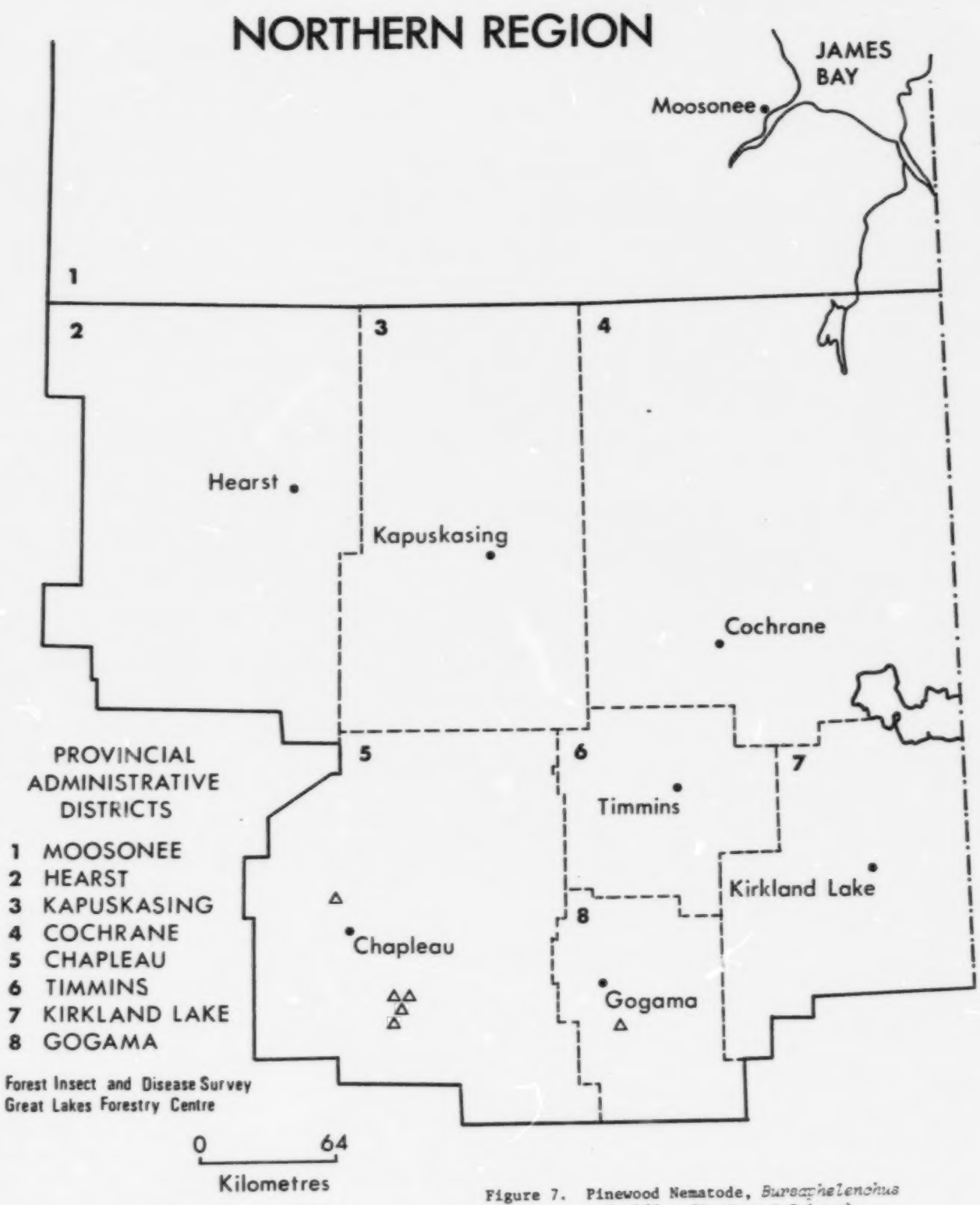


Figure 7. Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

Locations of positive samples taken in 1985 . . . . . △

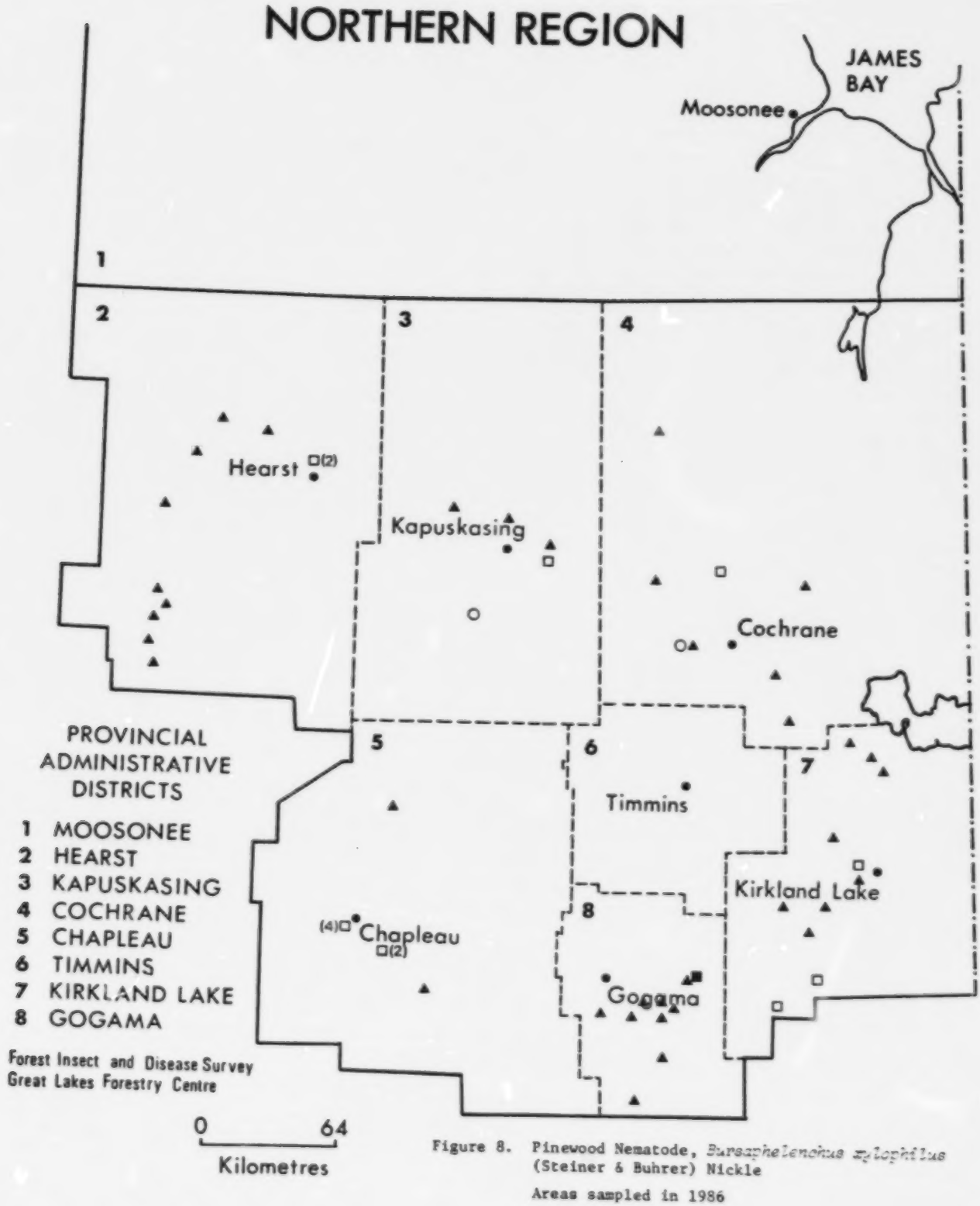


Figure 8. Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

Areas sampled in 1986

Jack pine . . . . . ▲
Balsam fir . . . . . ○
Black spruce . . . . . ■
**Monochamus* spp. . . . . □

*Numer of samples in parentheses

Climatic Data

Weather records for three stations, Earlton, Chapleau and Kapuskasing airports, have been included in this report (Table 16). Weather plays an important part in insect development and the spread of infectious diseases, and is the cause of many noninfectious conditions such as frost and hail damage, winter drying and drought. It also affects the success of spray operations for insect control.

Table 16. Summary of the mean temperature and total precipitation at three locations in the Northern Region in 1986.

Month	Mean temp. 1986 °C	Normal temp. °C	Dev. from norm. temp °C	Total precip. (mm)	Normal precip. (mm)	Dev. from norm. precip. (mm)
			Earlton			
Jan.	16.2	-16.3	+0.1	30.4	56.4	-26.0
Feb.	-14.3	-14.1	-0.2	11.1	47.2	-36.1
Mar.	-5.9	-7.6	+1.7	86.5	58.0	+28.5
Apr.	5.4	1.9	+3.5	57.2	50.0	+7.2
May	11.4	9.8	+1.6	78.3	61.3	+17
June	13.1	15.2	-2.1	57.0	89.2	-32.2
July	18.1	17.7	+0.4	67.3	80.8	-13.5
Aug.	15.3	16.2	-0.9	64.5	83.4	-18.9
Sept.	10.0	11.1	-1.1	106.2	99.1	+7.1
Oct.	4.3	5.4	-1.1	96.1	70.0	+26.1
Nov.	-5.3	2.5	-7.8	44.0	70.6	-26.6
Dec.	-8.6	-12.6	+4.0	46.4	56.3	-9.9
			Chapleau			
Jan.	-16.3	-16.9	+0.6	31.4	46.9	-15.5
Feb.	-13.5	-15.8	+2.3	17.9	34.5	-16.6
Mar.	-11.2	-8.6	-2.6	71.8	56.2	+15.6
Apr.	8.2	0.6	+7.6	3.8	59.3	-55.5
May	11.8	8.6	+3.2	58.4	73.8	-15.4
June	12.5	14.3	-1.8	78.6	100.4	-21.8
July	17.5	16.8	+0.7	77.2	81.8	-4.6
Aug.	15.1	15.4	-0.3	135.2	86.2	+4.9
Sept.	9.4	10.4	-1.0	124.6	101.5	+23.1
Oct.	3.5	4.9	-1.4	77.8	75.7	+2.1
Nov.	-5.6	-3.5	-2.1	32.0	64.2	-32.2
Dec.	-8.3	-12.8	+4.5	35.6	53.5	-17.9

(cont'd)

Table 16. Summary of the mean temperature and total precipitation at three locations in the Northern Region in 1986 (concl.)

Month	Mean temp. 1986 °C	Normal temp. °C	Dev. from norm. temp °C	Total precip. (mm)	Normal precip. (mm)	Dev. from norm. precip. (mm)
			Kapuskasing			
Jan.	-19.1	-18.6	-0.5	40.6	53.6	-13
Feb.	-15.6	-16.2	+0.6	17.4	43.0	-25.6
Mar.	-7.3	-9.4	+2.1	35.4	55.4	-20
Apr.	3.4	0.5	2.9	37.8	53.2	-15.4
May	11.2	8.3	2.9	41.6	74.3	-32.7
June	12.1	14.1	-2.0	90.7	84.7	+6.0
July	17.0	16.8	+0.2	53.0	96.3	-43.3
Aug.	14.9	15.3	-0.4	76.4	92.5	-16.1
Sept.	8.5	10.0	-1.5	68.0	94.4	-26.4
Oct.	2.5	4.4	-1.9	90.6	77.4	13.2
Nov.	-8.0	-4.4	-3.6	63.1	80.1	-17
Dec.	-9.4	-14.7	+5.3	32.0	53.3	-21.3